Declaration of Wendi Goldsmith

Pursuant to 28 U.S.C. § 1746, I, Wendi Goldsmith, declare the following based upon my personal knowledge:

1. My name is Wendi Goldsmith. I am 54 years old and competent to testify to all facts contained in this declaration. I submit this declaration in support of Conservation Law Foundation ("CLF")'s Comment on the United States Environmental Protection Agency ("EPA")'s Proposed 2020 Multisector General Permit, Docket ID # EPA-HQ-OW-2019-0372.
2. I have over thirty years of experience applying earth science principles to sustainable and disaster resilient planning, development, and natural resource restoration, much of which involved critical infrastructure protection and sensitive facilities. I have led research and development programs for the U.S. Department of Defense, developing methods for evaluating and optimizing renewable energy and efficient/resilient buildings, infrastructure, and site design. I played a lead role on the planning, design, and program management of the $14 billion post-Katrina Hurricane Storm Damage Risk Reduction System, the first regional-scale climate adapted infrastructure system in the US and winner of top national awards from the American Society of Civil Engineers, the American Council of Engineering Companies, and others. I have also written and presented extensively on climate change resilience in urban settings, and frameworks for decision-making under risk and uncertainty, including book chapters, peer reviewed articles, reports, formal seminars for multiple public agencies and academic institutions including Harvard Graduate School of Design, Metropolitan Transit Authority of New York, U.S. Army Corps of Engineers, and more. Given this extensive experience, I have expertise in the practical application of climate science in the built environment.
3. I received a *Doctor in Philosophy (PhD)* in Climate Resilience Science, Engineering,

Economics and Business from Aarhus University in Denmark in 2016. I received a *Master of Science* from the University of Massachusetts at Amherst in Plant and Soil Science in 2002 and a *Master of Arts* from the Conway School in Ecological Land Planning Design in 1990. I received dual *Bachelor of Arts* degrees from Yale University in Earth & Planetary Sciences and Studies in the Environment in 1988. I am a Licensed Professional Geologist in New Hampshire and Louisiana, and a Certified Professional Geologist by the American Institute of Professional Geologists. I am a Certified Professional in Erosion and Sediment Control and a Certified Profession in Stormwater Quality by EnviroCert International.

4. In 1992, I founded Bioengineering Group, where I served as CEO until its sale in 2014. The mission of Bioengineering Group was to build sustainable communities on an ecological foundation. As CEO, I led the planning, permitting and design of large-scale infrastructure projects such as renewable energy generation, highways, stormwater management systems, flood control facilities, and parks/greenways, as well as contaminated properties, including Superfund sites. I also acted as an advisor for site development and infrastructure projects regarding sustainable development methods suitable to changing climate and land use patterns. Prior to founding Bioengineering Group, I was an Environmental Planner at Charles T. Main Inc. from 1990 to 1991, where I conducted site investigations, worked on project planning and design, and prepared permit applications for utility corridors, hazardous materials cleanup and restoration, and solid waste containment and revegetation. I then worked as a Fluvial Geomorphologist for Bestmann Ingenieurbiologie GmbH in 1991, performing ecological restorations of rivers, streams, wetlands, coastal areas, and reservoirs in Germany.

5. I have worked on disaster resilience infrastructure projects across and outside the country for a diverse range of clients. A few examples include:

a. Following Hurricane Sandy, I was selected to review climate science and geomorphology best practices in relation to disaster recovery and resilient infrastructure improvements for LaGuardia Airport in New York, New York for two terminals operated by Delta Airlines. The project aimed to examine vulnerabilities and risks, identify appropriate mitigation measures and costs, and implement solutions that incorporated green infrastructure measures.

b. When a cluster of hurricanes affected the Gulf of Mexico shortly after commencement of engineering for the Panama Canal Expansion Project, I was tapped by the design team to lead an interdisciplinary review to ensure use of globally recognized practices for engineering with regard to climate change and disaster resilience. Under my guidance, the team identified several deficiencies which generally related to failure to address threats and vulnerabilities due to combined events, cascading cause-effect processes, and known forecasts of environmental conditions anticipated during the project's service life. Specific recommendations were made to address improvements of the design to remedy these deficiencies.

c. I led the Federal Reserve Bank Climate Risk Study in Boston, Massachusetts, which evaluated the risk from sea level rise and storm surge to its property in downtown Boston. The main gap in then-current understanding of facility vulnerability was the high potential for existing stormwater infrastructure to operate in reverse (bringing water into the site, rather than conveying it away) or to entirely rupture/collapse due to age and degraded condition during combined heavy rainfalls and high water levels in Boston Harbor. Study recommendations included increasing resilience through redundant measures including the construction of a stormwater "barricade" system, as well as modification/relocation of the facility's existing mechanical systems.

d. I integrated climate science into New Orleans' Hurricane and Storm Damage Risk Reduction System (HSDRRS) in Louisiana, a monumental undertaking to reduce flood vulnerability using multiple lines of defense surrounding New Orleans and its neighboring Parishes. Started in 2006, the project is the nation's first infrastructure system accounting for climate change adaptation and resilience, and it resulted in approximately $30 billion in prevented damages during Hurricane Isaac in 2012. Unlike the multi-billion-dollar set of infrastructure elements before Katrina, the rapidly planned, designed, and constructed HSDRRS did not rely merely on hindward-looking data as the basis of design. Instead, it systematically defined and applied known trends in sea level rise, local land subsidence rates, and storm patterns (rainfall, wind speed, wind field size, and more) to encompass predicted future conditions throughout the intended service life of the project. The project resulted in adoption of new protocols for multi-parameter forecast-based engineering guidance by the US Army Corps of Engineers, effectively setting the standard in the US for such work.

e. I led an Energy Quality Flow Analysis for Ultra-Low Communities for multiple Army installations seeking to reduce their vulnerability to loss of operations, while simultaneously improving their greenhouse gas footprint and reducing operating costs throughout facility life. Threats include changing climate conditions capable of shifting technical requirements and posing operational interruptions, as well as potential military contingency and terrorist incidents. The project identified cost-effective and risk-resilient energy choices, focusing on thermal energy through combined wastewater, district heating/cooling, and on-site renewables.

f. I led a Disaster Resilient Infrastructure Training Program for the Metropolitan Transportation Authority/New York City Transit to address recovery, disaster resilience and climate change factors following Hurricane Sandy. I ultimately researched and updated design team managers regarding global best practices for tunnel and rail flood mitigation, and then recommended suitable climate change factors to guide design based on then-current data and federal policy. The information aided the management team to identify specific deficits and feasible remedies to better coordinate multiple repairs and new construction elements in and around the New York City Subway System after it sustained billions in damages from Hurricane Sandy.

6. Outside of my career, I have dedicated myself to public service. In 1999, I co-founded the Center for Urban Watershed Resilience, a non-profit organization revitalizing the ecological, economic and social value of degraded urban sites. I have been a Board Director for the Center since its founding and currently serve as President. From 2008 to 2012, I served as a federal appointee to the National Women's Business Council. I have been on the International Council of Advisors for the Asian University of Women since 2010. Since 2014 I have served as Board Director for the Soil and Water Conservation Society, where I remain an active member. I am also a Fellow and lifetime member of the Society of American Military Engineers. In 2016, the American Association of Engineering Societies and National Audubon Society awarded me the Joan Hodges Queneau Palladium Medal. I am also a 2012 recipient of the Bronze Order of the De Fleury Medal for inspirational leadership to the Army Engineer Regiment.

I. EVALUATION OF THE PROPOSED 2020 MULTI-SECTOR GENERAL PERMIT

7. I am familiar with the EPA's 2020 Proposed Multisector General Permit for Industrial Stormwater Discharges. In particular, I have reviewed Section 2.1.1.8 and Request for Comment # 8.

8. As explained fully below, the MSGP maintains language from prior permits requiring consideration of climate change. These provisions include for example: disclosure of information relevant to design, operation and maintenance of facilities in the possession of regulated entities (as well as hired professional consultants such as engineers); identification of potential spill and discharge locations associated with flooding, run-on events such as storm surge and wave action, as well as surface runoff or flows that exceed the capacity of existing drainage infrastructure; engineer's and operator's certifications; design, operation and maintenance based on duties of care such as "good engineering practice," and annual update of SWPPPs based on available data. All of these provisions have long served as the regulatory foundation of the regulatory structure of the MSGP and, given the high level of scientific consensus and available data and modeling, have required and continue to require full consideration of climate change related impacts.

9. Though the proposed language for 2.1.1.8 does not directly remove or alter the requirements throughout the MSGP that facilities use "good engineering practices" in designing the facilities and preparing for severe weather events, its narrow and inadequate focus would constitute prohibited "back-sliding" if adopted in the final permit because it would narrowly constrain existing permit language requiring consideration of the well-documented current and increasing impacts of climate change. Proposed Section 2.1.1.8 would need to be significantly strengthened or revert to the 2015 MSGP language to conform to the regulatory standard required through

the longstanding structure of the previously issued MSGP.

A. Climate Change Is A Major Threat to Infrastructure, as Recognized by Government, Industry, and Engineers

10. It is beyond rational dispute that climate change has already caused dramatic changes in regional precipitation, increased the frequency and severity of precipitation events and storms, increased the frequency and severity of potentially catastrophic tropical storms including related storm surges and flooding, caused and contributed to sea level rise, and dramatically shifted air, water and surface temperature patterns. Further, these documented current impacts will continue and increase into the future both near and long term even if global emissions are stabilized immediately. Moreover, they will increase significantly to the extent current increasing emissions trends are not substantially curtailed. It is indisputable that the climate change poses substantial risks to long design-life public and private infrastructure and other complex facilities subject to the MSGP.

11. Within the Federal government, procedures and actions have become increasingly common to reassess, identify, and remedy deficiencies in project design and implementation, now that scientific consensus and relevant government policy is clear about how natural disaster impacts influenced by climate change pose substantial (and increasing) threats to public and private assets as well as public health and safety and the environment.

12. In a recent legal brief filed in federal court, the United States stated: "Climate change poses a monumental threat to Americans' health and welfare by driving long-lasting changes in our climate, leading to an array of severe negative effects, which will worsen over time." *Juliana v. U.S.*, No. 6:15-cv-01517, ECF No. 74.

13. The United States Global Climate and Health Assessment Report found that:

> Climate change projections show that there will be continuing increases in the

> occurrence and severity of some extreme events by the end of the century, while for other extremes the links to climate change are more uncertain. Some regions of the United States have already experienced costly impacts—in terms of both lives lost and economic damages (see Figure ES5)—from observed changes in the frequency, intensity, or duration of certain extreme events (see Table 1 in Ch 4: Extreme Events). While it is intuitive that extremes can have health impacts such as death or injury during an event (for example, drowning during floods), health impacts can also occur before or after an extreme event, as individuals may be involved in activities that put their health at risk, such as disaster preparation and post-event cleanup. Health risks may also arise long after the event, or in places outside the area where the event took place, as a result of damage to property, destruction of assets, loss of infrastructure and public services, social and economic impacts, environmental degradation, and other factors. Extreme events also pose unique health risks if multiple events occur simultaneously or in succession in a given location. The severity and extent of health effects associated with extreme events depend on the physical impacts of the extreme events themselves as well as the unique human, societal, and environmental circumstances at the time and place where events occur.

U.S. Global Change Research Program, Climate and Health Assessment Report, Chapter 4: Extreme Events, Summary (https://health2016.globalchange.gov)

14. EPA's 2009 endangerment finding concluded:

> The evidence concerning how human induced climate change may alter extreme weather events also clearly supports a finding of endangerment, given the serious adverse impacts that can result from such events and the increase in risk, even if small, of the occurrence and intensity of events such as hurricanes and floods. Additionally, public health is expected to be adversely affected by an increase in the severity of coastal storm events due to rising sea levels.

Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act, 74 Fed. Reg. 66,496, 66,497–98 (Dec.15, 2009).

15. In addition, it states:

> "Overall, the evidence on risk of adverse impacts for coastal areas provides clear support for a finding that greenhouse gas air pollution endangers the welfare of current and future generations. The most serious potential adverse effects are the increased risk of storm surge and flooding in coastal areas from sea level rise and more intense storms. Observed sea level rise is already increasing the risk of storm surge and flooding in some coastal areas."

Id. at 66,498.

16. Addressing sea level rise, the Endangerment Finding states:

> Although increases in mean sea level over the 21st century and beyond will inundate unprotected, low-lying areas, the most devastating impacts are likely to be associated with storm surge. Superimposed on expected rates of sea level rise, projected storm intensity, wave height, and storm surge suggest more severe coastal flooding and erosion hazards. Higher sea level provides an elevated base for storm surges to build upon and diminishes the rate at which low-lying areas drain, thereby increasing the risk of flooding from rainstorms. In New York City and Long Island, flooding from a combination of sea level rise and storm surge could be several meters deep. Projections suggest that the return period of a 100-year flood event in this area might be reduced to 19–68 years, on average, by the 2050s, and to 4–60 years by the 2080s. Additionally, some major urban centers in the United States, such as areas of New Orleans are situated in low-lying flood plains, presenting increased risk from storm surges.
>
> The Administrator finds that the most serious risk of adverse effects is presented by the increased risk of storm surge and flooding in coastal areas from sea level rise. Current observations of sea level rise are now contributing to increased risk of storm surge and flooding in coastal areas, and there is reason to find that these areas are now endangered by human-induced climate change.

Id. at 66,533.

17. The U.S. EPA states that:

> Sea level rise, heavy precipitation, and storm surge are expected to increase flooding and coastal erosion, and put further strain on aging infrastructure in the Northeast. Millions of Northeastern residents live near coastlines and river floodplains, where they are potentially more vulnerable to these climate-related impacts. During storm events with heavy precipitation, combined sewer-stormwater systems in this region can overload, resulting in wastewater discharge into bodies of water used for recreation or drinking water and creating health risks.

U.S. EPA "Climate Change in the Northeast" Webpage, *available at* https://19january2017snapshot.epa.gov/climate-impacts/climate-impacts-northeast_.html#Reference%201.

18. A recent journal article published "by researchers at the National Oceanic and Atmospheric Administration and the University of Wisconsin at Madison, analyzed satellite data over the last 40 years and found that planetary warming during that period increased the likelihood of a

tropical cyclone become a major hurricane — Category 3 strength or higher — by approximately 8% per decade." Chris D'Angelo, *Climate Change Is Fueling Stronger Hurricanes, Federal Study Finds*, HUFFPOST.COM (May 19, 2020), https://www.huffpost.com/entry/hurricanes-climate-change-noaa-study_n_5ec3e9ecc5b68a8b77d88276. The article noted:

> Over the past 40 y (and longer), anthropogenic warming has increased sea surface temperature (SST) in [tropical cyclone]-prone regions (22⇓–24), and, in combination with changes in atmospheric conditions, this has increased [tropical cyclone] potential intensity in these regions . . . . Based on physical understanding and robust support from numerical simulations, an increase in environmental potential intensity is expected to manifest as a shift in the [tropical cyclone] intensity distribution toward greater intensity and an increase in mean intensity.
>
> The greatest changes are found in the North Atlantic, where the probability of major hurricane exceedance increases by 49% per decade, significant at greater than the 99% confidence level . . . .

Kossin, James P., Knapp, Kenneth R., *et al.*, *Global increase in major tropical cyclone exceedance probability over the past four decades*, PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES, 2–3 (Apr. 10, 2020).

19. The United States' Climate and Health Assessment Report concluded:

> Existing infrastructure is generally designed to perform at its engineered capacity assuming historical weather patterns, and these systems could be more vulnerable to failure in response to weather-related stressors under future climate scenarios.,, Shifts in the frequency or intensity of extreme events outside their historical range pose infrastructure risks, which may be compounded by the fact that much of the existing critical infrastructure in the United States, like water and sewage systems, roads, bridges, and power plants, are aging and in need of repair or replacement., For example, the 2013 American Society of Civil Engineer's Report Card assigned a letter grade of D+ to the condition and performance of the Nation's infrastructure.

U.S. Global Change Research Program, Climate and Health Assessment Report, 4.3 Disruption of Essential Infrastructure, *available at* https://health2016.globalchange.gov/extreme-events.

20. The Government Accountability Office's Climate Information Report stated:

> Over the last decade, the federal government incurred over $300 billion in costs due to extreme weather and fire, according to the President's 2016 budget request. Costs are expected to grow as rare events become more common and intense due to climate change, according to the National Academies.
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> * * * *
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> The federal government recognizes the need to account for climate change risks in its planning and programs and has begun calling on agencies to take certain actions.

GAO Report to Congressional Requesters, Climate Information: A National System Could Help Federal, State, Local, and Private Sector Decision Makers Use Climate Information (Nov. 2015) *available at* https://energycommerce.house.gov/sites/democrats.energycommerce.house.gov/files/GAO%20Report%20FINAL--Climate%20Information%2012-8-15.pdf.

21. The Third National Climate Assessment found that "[i]nfrastructure is being damaged by sea level rise, heavy downpours, and extreme heat; damages are projected to increase with continued climate change." J. M. Melillo et al. eds., *Third Nat'l Climate Assessment*, at 15 (2014), and "Infrastructure will be increasingly compromised by climate-related hazards, including sea level rise, coastal flooding, and intense precipitation events," *id.* at 379. It further explained:

> Heavy downpours are increasing nationally, especially over the last three to five decades, with the largest increases in the Midwest and Northeast. Increases in the frequency and intensity of extreme precipitation events are projected for all U.S. regions. [High Confidence]
>
> The intensity, frequency, and duration of North Atlantic hurricanes, as well as the frequency of the strongest hurricanes, have all increased since the 1980s [High Confidence]. Hurricane intensity and rainfall are projected to increase as the climate continues to warm [Medium Confidence].
>
> In the next several decades, storm surges and high tides could combine with sea level rise and land subsidence to further increase coastal flooding in many regions. The U.S. East and Gulf Coasts, Hawaii, and the U.S.-affiliated Pacific Islands are particularly at risk.

Winter storms have increased in frequency and intensity since the 1950s, and their tracks have shifted northward [Medium Confidence]. Future trends in severe storms, including the intensity and frequency of tornadoes, hail, and damaging thunderstorm winds, are uncertain and are being studied intensively [Low Confidence]."

Melillo, J. M., T. (T. C.) Richmond, and G. W. Yohe, eds., 2014: Climate Change J. M. Melillo et al. eds., *Third Nat'l Climate Assessment*, at 841 (2014)

1. Private Industry

22. Private industry similarly recognizes the danger that climate change poses to their infrastructure, human health, and the environment.

23. As early as the 1970s, experts at ExxonMobil recognized the link between carbon dioxide and climate change: "[T]here is general scientific agreement that the most likely manner in which mankind is influencing the global climate is through carbon dioxide release from the burning of fossil fuels." Neela Banerjee, *et al.*, *Exxon's Own Research Confirmed Fossil Fuels' Role in Global Warming Decades Ago*, INSIDE CLIMATE NEWS (Sept. 16, 2015), *available at* https://insideclimatenews.org/news/15092015/Exxons-own-research-confirmed-fossil-fuels-role-in-global-warming.

24. ExxonMobil has stated that the "company [ ] engineers its facilities and operations robustly with extreme weather considerations in mind. Fortification to existing facilities and operations are addressed, where warranted due to climate or weather events, as part of ExxonMobil's Operations Integrity Management System." Energy and Carbon – Managing the Risks, at 14, http://www.lawandenvironment.com/wp-content/uploads/sites/5/2014/04/Report-Energy-and-Carbon-Managing-the-Risks1.pdf.

25. Royal Dutch Shell states in its 2016 Sustainability Report:

[t]he effects of climate change mean that governments, businesses and local

> communities are adapting their infrastructure to the changing environment. At Shell, we are taking steps at our facilities around the world to ensure that they are resilient to climate change. This reduces the vulnerability of our facilities and infrastructure to potential extreme variability in weather conditions.
>
> We take different approaches to adaptation for existing facilities and new projects. We progressively adjust our design standards for new projects while, for existing assets, we identify those that are most vulnerable to climate change and take appropriate action.

Royal Dutch Shell plc, Sustainability Rep., at 19 (2016), https://reports.shell.com/sustainability-report/2016/servicepages/download-centre.html. The report further states that "Shell has a rigorous approach to understanding, managing and mitigating climate risks in our facilities." *Id.*

26. BP is working with risk modeling firm Jupiter to "predict future flood and wind gust risk for coastal, inland, and offshore facilities" associated with climate change. https://jupiterintel.com/customers/.

27. The DuPont company's official Statement of Climate Change recognized that "urgent action" is necessary to address climate change:

> "The global scientific community is united in recognizing the urgent need to address greenhouse gas (GHG) emissions because of the role they play in climate change, a real and rapidly growing threat to society and the planet. The impact of climate change is already widespread across both human populations and natural ecosystems. Addressing climate change, and the GHG emissions that contribute to it, requires urgent action and long-term commitments by every segment of society, including the business community. Strategies to reduce GHG emissions, such as setting and meeting aggressive reduction goals, are far more effective over time than attempting to remediate each natural and humanitarian disaster that results from climate change. A combination of technology innovation, market-based policies and evolving consumer habits are necessary to reduce GHG emissions and achieve global climate goals, such as those outlined in the Paris Agreement and Intergovernmental Panel on Climate Change (IPCC) reports."

DuPont de Nemours, Inc. Statement on Climate Change, https://www.dupont.com/position-statements/climate-change.html.

28. These actions include the necessity for climate mitigation: "We are committed to bringing our

best thinking, fervent action and scientific innovations to market, supporting both the mitigation and adaptation actions needed to address the impacts of climate change." *Id.*

29. Chemical manufacturer Arkema has stated publicly, "The Earth is getting warmer! The phenomenon of climate disruption and its origin are now no longer in question." COP21: Arkema is committed to climate, https://www.arkema.com/en/social-responsibility/cop21/.

30. Chairman of the Board for Bayer, Werner Baumman, has stated, "Climate change has become a concrete threat to life on Earth." Bayer Sustainability Report 2019, 10, https://www.bayer.com/en/sustainability-reports.aspx.

31. The Bank of England recognizes climate change as a necessary factor to consider when determining risk.

> Physical risks from climate change manifest themselves in changes to both the frequency and severity of specific weather events (such as heatwaves, floods, wildfires and storms) and, in the longer term, broader shifts in climate such as changes in precipitation and extreme weather variability, sea level change and rising average temperatures (IPCC, 2014).
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> Losses related to physical risk factors directly affect insurance firms' liabilities through higher claims, and physical risks may extend beyond the immediate impact of natural catastrophes, for example through the disruption of supply chains.
>
> The report recognises the challenge of assessing these financial impacts on general insurers' liabilities. Weather-related risk estimates under current climatic conditions already contain significant uncertainty; this uncertainty is exacerbated when estimates are projected to reflect possible future climatic conditions. This report takes as a key premise that business decisions that are impacted by climate change can be informed by attempts to assess related risks despite the implicit uncertainty.

Bank of England, *A framework for assessing financial impacts of physical climate change*, 4 (May 2019), https://www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/publication/2019/a-framework-for-assessing-financial-impacts-of-physical-climate-change.pdf?la=en&hash=2676FF477911CA0EB39E62D6F672FCD2162BD2BC#page=10.

32. "Climate change is therefore a central issue to consider and is widely seen as one of the biggest threats to a sustainable future. The steady rise in human activity – and the subsequent greenhouse gas emissions – witnessed since the industrial revolution has already had a considerable and measurable impact on our planet." Bank of England, *Climate change: why it matters to the Bank of England*, https://www.bankofengland.co.uk/knowledgebank/climate-change-why-it-matters-to-the-bank-of-england.

33. BlackRock also sees climate change as a compulsory consideration in any future planning.

> The evidence on climate risk is compelling investors to reassess core assumptions about modern finance. Research from a wide range of organizations – including the UN's Intergovernmental Panel on Climate Change, the BlackRock Investment Institute, and many others, including new studies from McKinsey on the socioeconomic implications of physical climate risk – is deepening our understanding of how climate risk will impact both our physical world and the global system that finances economic growth.
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> *****
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> A pharmaceutical company that hikes prices ruthlessly, a mining company that shortchanges safety, a bank that fails to respect its clients – these companies may maximize returns in the short term. But, as we have seen again and again, these actions that damage society will catch up with a company and destroy shareholder value.

Letter from BlackRock CEO Larry Fink to CEOs: A Fundamental Reshaping of Finance, https://www.blackrock.com/corporate/investor-relations/larry-fink-ceo-letter.

34. "The need is particularly urgent for cities, because the many components of municipal infrastructure – from roads to sewers to transit – have been built for tolerances and weather conditions that do not align with the new climate reality. In the short term, some of the work to mitigate climate risk could create more economic activity. Yet we are facing the ultimate long-term problem." *Letter from BlackRock Global Executive Committee to BlackRock Clients: Sustainability as BlackRock's New Standard for Investing*,

https://www.blackrock.com/corporate/investor-relations/blackrock-client-letter.

2. Engineers

35. The American Society of Civil Engineers supports both "[g]overnment policies that encourage anticipation of and preparation for impacts of climate change on the build environment," "[r]evisions to engineering design standards, codes, regulations and associated laws that strengthen the sustainability and resiliency of infrastructure at high risk of being affected by climate change," and "[i]dentifying critical infrastructure that is most threatened by changing climate in a given region and informing decision makers and the public." ASCE Policy Statement 360.

36. ASCE recognizes that "Climate change poses a potentially serious impact on worldwide water resources, energy production and use, agriculture, forestry, coastal development and resources, flood control and public infrastructure." ASCE Policy Statement 360.

37. ASCE also recognizes "Climate extremes such as floods and droughts and other significant variations in hydrologic patterns that may necessitate changes or additions to flood control and public infrastructure in order to provide adequate public safety and sustainable performance."

38. ASCE concludes:

> Civil engineers are responsible for the planning, design, construction, operations and maintenance of physical infrastructure, including buildings, communication facilities, energy generation and distribution facilities, industrial facilities, transportation networks, water supply and sanitation systems, and water resources facilities. and urban water systems. Most infrastructure typically has long service lives (50 to 100 years) and are expected to remain functional, durable and safe during that time. These facilities are exposed to and often are vulnerable to the effects of extreme climate and weather events. Engineering practices and standards associated with these facilities must be revised and enhanced to address climate change to ensure they continue to provide acceptably low risks of failures and to reduce vulnerability to failure in functionality, durability and safety over their service lives.

ASCE Policy Statement 360.

39. ASCE's 2017 Infrastructure Report Card concluded that "The concentration of [oil and gas] processing plants on the shores of southern states creates significant exposure to future storm and climate change impacts." 2017 Infrastructure Report Card at 43.

40. ASCE also notes:

> Periodic oil and gas pipeline leaks and failures present risks to the environment and the public. Most domestic oil refineries are situated along the coasts, subjecting them to risks from receding shorelines, climate change, and storm-related impacts. Each time there is a pipeline break or refinery outage, prices spike and supply is disrupted, with even minor disruptions having immediate impact. Statistics maintained by the PHMSA indicate that the frequency of significant pipeline incidences has remained flat in recent years; however, each incident typically results in injuries and/or deaths, environmental impacts, and regional economic disruption. Meanwhile, the number of reported "spill" events has increased in the last several years, up from 573 in 2012 to 715 in 2015, and events such as multiple leaks at the Aliso Canyon gas storage field in California and Colonial gasoline pipeline failures in Alabama have highlighted system fragility and prompted federal rulemaking.

2017 Infrastructure Report Card at 44.

> Impacts of more intense storms, increased flooding, and rising sea levels may jeopardize a large number of constructed remedies at Superfund sites. EPA's inventory of Superfund sites shows that over 500 Superfund sites are within a 100-year floodplain or at an elevation less than 6 feet above mean sea level, and it is likely that a portion of the engineered systems in place at these sites are vulnerable.

Id. at 52.

41. In 2019, ASCE issued a new Manual of Practice, MOP-140, entitled "Climate-Resilient Infrastructure: Adaptive Design and Risk Management."

42. Similar to ASCE, ASTM International has published a Standard Guide for Climate Resiliency Planning and Strategy, providing guidance on resilience strategies to protect, among other things, infrastructure lying in floodplains. ASTM E3032-15e1.

43. The prominent infrastructure engineering firm AECOM has warned about the substantial risks posed by climate change:

> The growing intensity and frequency of severe storms, flooding and storm surges, extreme temperature events, droughts, firestorms, and sea-level rise on every continent have had major impacts on global populations and infrastructure. Over the past 20 years, these natural hazards have demonstrated a widespread lack of business preparedness and limited ability to respond to threats to business assets, operations, raw materials, power and water supplies, supply chains — and ultimately, economic viability.

AECOM Press Release, https://aecom.com/press-releases/climate-change-and-adaptation-experts-detail-strategies-in-preparing-for-climate-related-hazards-and-disasters/.

44. AECOM is clear about the importance of building infrastructure resilient to climate change:

> While historic weather data was once a key element in long-term business planning, businesses today must make decisions based on entirely new climate norms and much more extensive climate-related impacts. However, with an understanding of its climate-related risk profile and a plan for integrating resilience into existing business processes, companies can mitigate impacts and recover much more quickly from hazards and disasters.

Id.

45. Some engineering firms are specifically marketing climate change mitigation and adaptation services to their clients.

46. The engineering firm Geosyntec has a division focused on climate resilience and adaptation. It notes that:

> Our environment has been experiencing changes in climate patterns in ways that were not anticipated by the designers of our coastal and upland surface-water water management systems.
>
> Annual rainfall amounts may remain about the same. But instead of falling over long period, it may fall in a shorter period, drastically increasing the likelihood of flooding and altering the performance of existing drainage systems. Meanwhile, other areas are experiencing drought conditions for the first time in modern history.
>
> Upward trends in sea levels, coupled with "king" tides, are causing regular nuisance flooding in many coastal communities. Small increases in sea level can result in large impacts.
>
> Larger, more powerful tropical storms make landfall with greater windspeeds, and storm surges, which overtop seawalls and coastal protections, leaving wide and

long trails of destruction.

> The resiliency of businesses, cities, institutions, and our infrastructure depends upon a cycle of risk assessment and planning, identification and implementation of adaptative solutions, and evaluation and monitoring during adverse conditions.

Resilience and Adaptation, Geosyntec, https://www.geosyntec.com/markets/resilience-and-adaptation.

47. Engineering firm Exponent has an "extreme-weather-related risk management" practice that focuses on assisting clients with forward-looking climate -change risk modeling. In discussing this work, Exponent explains:

> It is important for corporations and government entities alike to consider a changing, non-stationary set of conditions when assessing and mitigating the risk of infrastructure destruction, business interruption, and consequences of chemical releases that can be caused by extreme weather events. [Exponent]

https://www.exponent.com/knowledge/thought-leadership/2018/12/extremeweatherrelated-risk-management/?pageSize=NaN&pageNum=0&loadAllByPageSize=true.

3. Discussion/Standards

48. Known trends in changing rainfall intensity are well explained by climate change models based on observations of historic events. For example, New England has already endured numerous events which are officially recognized as being part of a pattern of extreme weather conditions affected by climate change processes. One of these is the intense storm of 10 July 2010 that already caused discharge of pollutants from a tank farm. The US Geological Survey, National Oceanographic and Atmospheric Administration, Northeast Climate Science Center, and others haves published findings based on updated statistical methodologies that recent decades of rainfall patterns show a peak 24-hour rainfall intensity which is on the order of 75% higher than prior decades, in essence documenting that rainfall volumes experienced today are already almost twice what they were understood to be in the past, due to climate change.

49. In light of the above, it is clear that risk (which is in turn a function of threat, vulnerability, and consequence) must be managed systematically with future conditions in mind. Any asset/project owner, and by extension any reasonable engineer tasked with design and/or operations of durable infrastructure and other complex facilities, will find it necessary to analyze the potential anticipated climate-change-related threats to the asset throughout its design life. Also vulnerability of the asset should be considered under a comprehensive set of future multi-hazard scenarios, not only those in which so-called "stillwater" inundation occurs due to storm impacts or sea level rise, but also those in which second order effects such erosion of containment berms, clogging of drainage pipes with debris or flotsam, lack of access due to impassable road networks for operations and response actions, and catastrophic failure such as facilities collapsing or floating off their foundations. Lastly, responsible owners and their engineers must consider not only the intended operations of the facility itself, but also the consequences that may be anticipated to arise from extreme weather impacts, including distribution patterns of contaminants or other offsite, indirect impacts to human health and safety and the environment.

50. The language in Section 2.1.1.8 of the 2020 Proposed MSGP does not sufficiently account for major shifts in scientific understanding related to many types of change affecting complex and interdependent natural/built systems where human land use patterns and other impacts inherently alter and shift patterns and processes due to a wide range of factors. These concepts are broader than climate change, *per se*, and reflect what many have characterized as a major scientific revolution in which responsible analysis must include more than a cursory assessment of limited or selective data from the past, but instead must account for risk and uncertainty connected with future conditions which broadly cannot be assumed to resemble historic records, and often are understood through models and forecasts. The highly-cited paper published in

Science – Climate Change, "Stationarity Is Dead: Whither Water Management?" (Milly, et al. 2008), provides an accessible treatment of this important topic, and is considered by many professionals to mark a wholesale shift in practice standards related to water resources planning and engineering.

51. Sea level rise combined with storm surge and also wave height additively are capable of contributing to water surface elevations which can cause overtopping, erosion, and other damaging impacts to coastal industrial facilities. Sea level rise is not a distant "theoretical" possibility, but rather a potentially sudden, though short- lived, effect which periodically occurs due to ephemeral shifts in ocean currents which "stall" water flows along the Atlantic US coast, causing it to "back up" at higher water surface elevations. The Miami FL area has experienced several such incidents which caused water surfaces to be 1.5 feet higher than predicted. Due to the low-lying and porous local terrain, these short-lived unpredicted floods placed salt water in contact with pumps and other equipment normally shut down in time to prevent salinity exposure. The costly damage to the equipment affects short- and long-term operability. Throughout the North Atlantic coastline, similar incidents have occurred, though they are frequently difficult for observers to distinguish from variations due to lunar and wind field effects. This type of effect in the Atlantic Meridional Overturning Circulation (AMOC) flows is understood to become more variable due to several climate change factors, and currently influences water surface elevations up to three feet or more, possibly more in the future under specific circumstances.

52. The combined effects of sea level rise and intensified precipitation patterns, plus erosion and geomorphic shifts in the nearby coastal and riverine corridors, has the potential to affect inland and especially coastal facilities across the US in multiple ways they are unlikely to have factored in during initial design, given the age of many facilities currently operating under CWA permits.

53. Hurricanes Katrina, Rita, Sandy, (and later, Harvey) caused substantial impacts to coastal and inland industrial facilities, with ensuing spread of contaminants, as well as damage to the facilities themselves which interrupted critical industrial supplies (such as fuel for cars, trucks, and back-up generators). The U.S. Army Corps of Engineers was tasked through Federal Law 113-2, Chapter 4, to complete a report detailing the results of a two-year study to address coastal storm and flood risk to vulnerable populations, property, ecosystems, and infrastructure affected by Hurricane Sandy in the United States' North Atlantic region from Virginia through New Hampshire, with an eye towards spotting gaps between how projects were designed in their time, versus what is commonly understood today to be an adequate standard. Known as the North Atlantic Coast Comprehensive Study, it was intended to help local communities better understand the issue of changing flood risks associated with climate change, and to equip them with tools to help prepare for future flood risks. It built on lessons learned from Hurricane Sandy and attempts to summarize and synthesize the latest scientific information available for state, local, and tribal planners. The conclusions of the study, as detailed in the final report, include several findings, outcomes, and opportunities, such as the use of a nine-step Coastal Storm Risk Management Framework that can be customized for any coastal watershed. The implications of the North Atlantic Coast Comprehensive Study have been widely recognized as clarifying a new framework and generally raising the bar for the practice of engineering specific to coastal risks, with many government and private sector practicing professional regarding it as an excellent encapsulation of current standards of "good engineering practices."

B. Current MSGP Regulatory Standard

54. In my experience, I am familiar with reviewing and applying regulatory language such as that in the 2015 MSGP and the Proposed 2020 MSGP. In my opinion based on extensive

professional work in this domain, plus familiarity with other standards and practices by others, the 2015 MSGP adopts a "good engineering practices" standard that requires permittees to anticipate reasonably foreseeable risks, including climate change risks, and to design and construct their facilities to protect the facilities from these reasonably anticipated risks.

55. The 2015 MSGP sets a "good engineering practices" standard for both control measures and creation of the Stormwater Pollution Prevention Plan ("SWPPP").

56. Section 2.1 of the 2015 Permit states:

> You must select, design, install, and implement control measures (including best management practices) to ***minimize pollutant discharges*** that address the selection and design considerations in Part 2.1.1, meet the non-numeric effluent limits in Part 2.1.2, meet limits contained in applicable effluent limitations guidelines in Part 2.1.3, and meet the water quality-based effluent limitations in Part 2.2. The selection, design, installation, and implementation of these control measures must be ***in accordance with good engineering practices*** and manufacturer's specifications.

2015 MSGP § 2.1.

57. The 2015 MSGP defines the term "minimize" to mean reduce and/or eliminate to the extent achievable using control measures (including best management practices) that are technologically available and economically practicable and achievable in light of best industry practice." 2015 MSGP § 2.

58. Two of the "control measure selection and design considerations" to which the good engineering practices standard applies are:

> Preventing stormwater from coming into contact with polluting materials is generally more effective, and less costly, than trying to remove pollutants from stormwater;
>
> * * * *
>
> Assessing the type and quantity of pollutants, including their potential to impact receiving water quality, is critical to designing effective control measures that will achieve the limits in this permit;

2015 MSGP § 2.1

59. The 2015 MSGP applies the "good engineering practices" standard to control measures to satisfy non-numeric technology-based effluent limits, including the requirements to (i) "minimize the exposure of manufacturing, processing, and material storage areas . . . to rain, snow, snowmelt, and runoff in order to minimize pollutant discharges" (ii) "minimize the potential for leaks, spills and other releases that may be exposed to stormwater and develop plans for effective response to such spills if or when they occur in order to minimize pollutant discharges," (iii) manage runoff "to minimize pollutants in [] discharges," and (iv) eliminate non-stormwater discharges.

60. The 2015 MSGP also applies the "good engineering practices" standard to preparation of the SWPPP: "The SWPPP shall be prepared in accordance with good engineering practices and industry standards." 2015 MSGP § 5.1. The SWPPP must describe how the control measures address the "selection and design considerations" and the "non-numeric effluent limitations." 2015 MSGP § 5.2.4. It also requires the permittee to evaluate and identify all potential sources of pollutants. 2015 MSGP §§ 5.2.3.

61. By requiring permittees to use "good engineering practices" to develop and implement control measures, the MSGP requires industrial facilities to assess their vulnerabilities in light of climate change, develop engineering design plans to adequately address those vulnerabilities, and ultimately implement measures that will protect each facility and other surrounding communities from contamination from this facility.

62. Many engineering organizations have been on record in broad and specific ways to include the need to address climate change effects when addressing natural hazard mitigation and facility design. The list of US and international professional organizations adopting, refining, and

promulgating guidance on the issue grows steadily. The Engineering Standard of Care doctrine includes various considerations such as applying higher levels of certainty and lower degrees of risk when addressing human health and safety, as opposed to matters of nuisance or preference. Identifying which data set to use when determining rainfall amounts for hydrologic calculations is part of the engineering process, and there is not one method, but rather an expectation that professionals will use adequately conservative sets of information, including publicly available updates or identifications of known data gaps or shortfalls.

63. The National Academy of Sciences study on Improving the EPA Multi-Section General Permit for Industrial Stormwater Discharges noted:

> Design storm analysis is based on historical data and assumes climate stationarity—the use of previous events to predict those of the future. However, with climate change, historic precipitation records may not capture the full variability or likelihood of future conditions. Forward-looking predictive models may be necessary to properly design future SCMs, considering nonstationarity scenarios.

NAS Study at 70.

64. EPA itself has recognized permittees' duty to assess climate vulnerability in its *Framework for Protecting Public and Private Investment in Clean Water Act Enforcement Remedies*: "[I]t is important for each regulated entity to assess its own vulnerability and consider a range of options that address its particular obligations and goals as well as resource challenges." *Framework for Protecting Pub. & Priv. Inv. in CWA Enf't Remedies*, EPA, at 1-2, https://www.epa.gov/sites/production/files/2016-12/documents/frameworkforprotectingpublicandprivateinvestment.pdf (last visited May 18, 2020).

65. While the EPA may not currently have published tools related to accounting for climate change and other phenomena such as geostatic rebound which affect relative sea level rise, other more appropriate Federal agencies do. The nation's preeminent engineering organization, the US

Army Corps of Engineers, first published sea level rise guidance for designers in 1992, and then made wholesale upgrades to the sophistication and comprehensiveness of their approach in response to Hurricane Katrina during their effort to construct a coastal flood infrastructure system designed to avoid similar future impacts.

66. In a 2013 regulation entitled "Incorporating Sea Level Change in Civil Works Programs," the Army Corps stated:

> [Sea level change] can cause a number of impacts in coastal and estuarine zones, including changes in shoreline erosion, inundation or exposure of low-lying coastal areas, changes in storm and flood damages, shifts in extent and distribution of wetlands and other coastal habitats, changes to groundwater levels, and alterations to salinity intrusion into estuaries and groundwater systems.

Army Corps of Engineers, Regulation No. 1100-2-8162, at Appendix B, B-1 (Dec. 31, 2013).

67. Part of the Army Corps' protocol includes planned regular updates to their methodology and data as science and policy continue to develop. The nation's single largest public works infrastructure investment, the $14 billion greater New Orleans HSDRRS, used the USACE protocol and applied these principles, as have numerous other USACE and non-USACE public and private projects initiated since 2006. I personally interfaced extensively with USACE personnel and engineering staff from ARCADIS, Shaw, TetraTech, and other firms during the conduct of planning, design, and construction management for the HSDRRS program, and can attest to the broad and pragmatic familiarity with the principles and procedures to address predicted future conditions, including those stemming from climate change. After Hurricane Sandy affected the North Atlantic region, it became a federal priority to ensure that not only new engineering projects, but also past infrastructure investments were systematically managed in a way that adequately accounted for new information corresponding to design performance and failure risks.

68. As explained above, climate change has greatly increased the risks of flooding from precipitation, storm surge, and sea level rise, and the risk continues to increase over time. The potential impacts on human health and the environment of large-scale flooding at industrial facilities are very high. Therefore, any reasonable engineer designing and implementing control measures to minimize the potential for pollution would take these risks into account and implement control measures to minimize the risk of flooding.

69. The Proposed MSGP has identical provisions to the 2015 MSGP adopting the "good engineering practices" standard, which it must, to avoid impermissible backsliding. Proposed MSGP §§ 2.1, 6.1.

II. PROPOSED PERMIT DEFICIENCIES

A. The permit conditions and standards included in Section 2.1.1.8 of the proposed 2020 MSGP are less stringent and therefore unlawful under the Clean Water Act's anti-backsliding requirements. See 33 U.S.C. § 1342(o).

70. The Clean Water Act ("CWA") anti-backsliding[1] provision prohibits permits from having less stringent effluent limitations than the previous permit. *See* 33 U.S.C. § 1342(o). Section 402(o)(3) of the CWA is a safety clause that provides an absolute limitation on backsliding:

> This section of the CWA prohibits the relaxation of effluent limitations in all cases if the revised effluent limitation would result in a violation of applicable effluent guidelines or water quality standards, including antidegradation requirements. Thus, even if one or more of the backsliding exceptions outlined in the statute is applicable and met, CWA section 402(o)(3) acts as a floor and restricts the extent to which effluent limitations may be relaxed. The requirement affirms existing provisions of the CWA that require effluent limitations, standards, and conditions to ensure compliance with applicable technology and water quality standards.

[1] Anti-backsliding "refers to statutory and regulatory provisions that prohibit the renewal, reissuance, or modification of an existing NPDES permit that contains effluent limitations, permit conditions, or standards less stringent than those established in the previous permit." U.S. Envtl. Prot. Agency, *NPDES Permit Writers' Manual*, at 7-2 (Sept. 2010), https://www3.epa.gov/npdes/pubs/pwm_chapt_07.pdf.

U.S. Envtl. Prot. Agency, *NPDES Permit Writers' Manual*, at 7-4 (Sept. 2010), https://www3.epa.gov/npdes/pubs/pwm_chapt_07.pdf.

71. In my experience, I am familiar with reviewing and applying regulatory language such as that in the 2015 MSGP and the Proposed 2020 MSGP. In my opinion based on extensive professional work in this domain, plus familiarity with other standards and practices by others, the 2020 MSGP adopts standards that are weaker than the 2015 MSGP.

72. In an effort ostensibly intended to "clarify" some of the MSGP requirements, the language proposed by EPA in Section 2.1.1.8 violates Section 402(o) by narrowing the scope of the control measures to exclude consideration of all of climate change related impacts, including sea-level rise and storm surge, and by basing a facility's risk designation on Federal Emergency Management Agency ("FEMA") flood risk assessments. As discussed above, the 2015 MSGP requires consideration of all climate change impacts and requires a prospective risk assessment based on good engineering practices. The use of the Base Flood Elevation (BFE) indicated on a FEMA Flood Insurance Rate Map (FIRM) is not adequate for most engineering purposes, and especially not in cases understood to involve life or safety risk. Because the intended purpose of a FIRM is to indicate general property risk in relation to an annual contract with a calculated flood insurance premium, the analysis behind the map does not include long-term forward-looking factors. Specifically, the "current" FIRM for any specific parcel may be decades old and contain outdated topographic conditions as well as stale methods of calculating or modeling rainfall, runoff, watershed hydrology, hydraulics, multiple factors such as wave action, and overall actual flood risk. As of this writing, no FIRM has been published which factors in known rates of local relative sea level rise or any other specific climate change forecast inputs. Also, while any given FIRM may surely be interpreted to indicate those areas most likely to

experience flooding, it is also true that more than half of all flood damage ever recorded by FEMA occurs outside of the mapped areas indicating a 1% annual risk of flooding. Thus, the BFE associated with the 1% annual risk of flooding is less than 50% accurate in predicting where floods are prone to occur. As such, the BFE from a FIRM may be useful for initial screening-level assessment in the absence of more accurate information (including to identify the need for more detailed analysis) but it is entirely inadequate to inform engineering where life or safety risk is posed to human health or the environment. The permit conditions and standards in the 2020 MSGP are less stringent than those in the 2015 Permit and therefore adoption of the language proposed in Section 2.1.1.8 of the 2020 MSGP is in violation of Section 402(o) of the CWA.

B. The use of FEMA FIRMs as a basis for benchmarking control measures and identifying at-risk facilities is inadequate and a less stringent requirement than the 2015 MSGP.

1. <u>BFE is a narrowly applicable flood insurance rate-setting metric inappropriate for use as a tool to define engineering standards.</u>

73. As noted in *Request for Comment 8* and footnote 5, BFE "is the computed elevation to which floodwater is anticipated to rise during the base flood," which is what the Federal Emergency Management Agency ("FEMA") has determined to be the 100-year flood, or the flood with a one percent annual chance of being equaled or exceeded in a given year. Areas that will be inundated in the event of a 100-year storm are designated Special Flood Hazard Areas ("SFHA") on FEMA Flood Insurance Rate Maps ("FIRMs"). However, FEMA created these maps not as a tool for designing facilities and infrastructure to prevent discharge of pollutants by withstanding storms and floods in such areas, but for the purpose of providing federal government subsidized insurance to homeowners with federally insured mortgages. Moreover, the FEMA FIRMs are based on historic data, not forecasts spanning long service lives of

complex facilities or infrastructure, and they are infrequently updated.

74. One of the clearest examples of the gross ineffectiveness of relying on FEMA FIRMs to identify the risk of a given facility is Hurricane Harvey. Harvey was a 500-year storm (in the traditional historic context) that devasted the Houston area, a slow-moving onslaught of rain that caught the city unawares and wreaked havoc on Houston homes and industrial facilities alike. Yet Harvey was not the first such storm to pass through Houston in 500 years. In fact, Harvey was *the third such storm in three years* to bombard the area, and it was Houston's very reliance on the 1-in-500 year probability that led the city to inadequately prepare, leading to unnecessary and disastrous consequences. *See* Dara Lind, *The "500-year" flood: why Houston was so underprepared for Hurricane Harvey*, VOX (Aug. 28, 2017), https://www.vox.com/science-and-health/2017/8/28/16211392/100-500-year-flood-meaning ("Tomball, Texas, Public Works director David Esquivel told a local paper there this year that the Houston area had 'two 500-year storms back to back': over Memorial Day weekend of 2015 and early April 2016. That means that Hurricane Harvey constitutes the third '500-year' flood in three years."). As Lind noted, "Either Houston is incredibly unlucky or the risk of severe flooding is a lot more serious than the FEMA modeling has predicted — and the odds of a flood as bad as the ones Houston has seen for the past few years are actually much higher than 1 in 500." *Id.; see also* Eric S. Blake & David A. Zelinsky, Nat'l Hurricane Ctr., *Tropical Cyclone Report: Hurricane Harvey* 1, 9 (2018), *available at* https://www.nhc.noaa.gov/data/tcr/AL092017_Harvey.pdf (noting that "a majority of the residential flood loss claims [from Harvey] are from outside the 500-year flood plain")

2. <u>The specific references to BFE and SFHA in the 2020 MSGP constitute unlawful backsliding.</u>

75. The 2020 MSGP references "BFE" in two instances. Section 2.1.1.8(b) and (d) suggest using

BFE as a height by which to raise or store structures and materials to supposedly protect them from flooding. However, as discussed immediately *supra*, using BFE as a proxy for "safe height" is risky and unsound as an engineering practice.

76. Even if BFE were a valid metric to prevent infrastructure or materials from flooding, (it is not), it goes against engineering practice to rely solely on BFE; even minimal standards incorporate some level of freeboard, "a term used by FEMA's National Flood Insurance Program (NFIP) to describe a factor of safety usually expressed in feet above the 1-percent-annual chance flood level." FEMA Factsheet, *Building Higher in Flood Zones: Freeboard – Reduce Your Risk, Reduce Your Premium*, *available at* https://www.fema.gov/media-library-data/1438356606317-d1d037d75640588f45e2168eb9a190ce/FPM_1-pager_Freeboard_Final_06-19-14.pdf.

77. BFE on its own, aside from being unreliable and inadequate, provides no margin of error for common flooding occurrences such as wave action, mobilized debris, and more.

78. This weakening of the permit by explicitly incorporating BFE is particularly concerning because of the types of facilities subject to the MSGP and the immense potential for devastating results should a facility flood.

79. Request for Comment 8 suggests further weakening the MSGP by using the SFHA to identify facilities that are at the highest risk for stormwater impacts and extreme flooding conditions in cases where recognized impacts to human health and safety and the environment exist.

80. As discussed above, FEMA FIRMs were created as an insurance premium pricing tool and were created based on often incomplete historic data that does not take into account recent or future climate change impacts.

81. As a result, using the FIRMs as a tool to identify risk will miss large swaths of facilities that are

currently at high risk of flooding, and ignores that certain facilities may have specific characteristics that make them more susceptible to flooding in addition to their location, namely through erosion, backwater effects, debris jams affecting bridges or pipes, etc.

C. The 2020 MSGP does not require consideration of ALL climate change-related impacts and therefore impermissibly weakens effluent limitations.

82. Section 2.1.1.8 of the 2020 MSGP makes no mention of climate change or its associated impacts and unlawfully weakens effluent standards by narrowing the focus of preparedness to "major storm events that cause extreme flooding conditions." While well-meaning, this language not only implies facilities need not consider prospective increases in risk based on increased frequency and severity of storms and sea-level rise, but, combined with the suggestion that FEMA FIRMs are an accurate measure of current risk, the language indicates that risk calculation based on historical data is sufficient to protect facilities, surrounding communities, and the environment in the event of a storm.

83. Moreover, even if the language could be read to include consideration of the increased frequency of storms, both major and minor, and the increasingly severe nature of storms, the 2020 MSGP still falls short of the 2015 version because it excludes consideration of sea-level rise and storm surge flooding. Storm surge flooding exacerbates and contaminates stormwater by infiltrating and flooding secondary containment structures and drainage areas, carrying debris that clogs drainage areas and creates backup, and potentially mobilizing heavy objects which may then destroy control measures and/or other structures.

D. The proposed use of temporary measures to accommodate major storm events impermissibly weakens the permit because it ignores that these events have become more frequent and have increased in intensity and implies that more permanent measures are unnecessary.

84. Sections 2.1.1.8(c)–(f) weaken the 2020 MSGP by identifying temporary measures to be taken

only in the event of an oncoming storm. Such temporary measures presuppose that i) storms will be infrequent enough to make temporary measures sustainable on a regular basis, ii) facilities will be able to predict in advance and with certainty which storms will pose a flooding risk, and iii) permanent infrastructure (such as warehouses for storing or roads for transporting necessary materials or equipment) is already out of harm's way in the event of a flood.

E. Necessary Improvements in Proposed Language to Avoid Backsliding

85. Floodplain management is not simple, and attempting to define flood risk based on a BFE line drawn on a FIRM has long been known by those familiar with relevant issues to be inadequate for many tasks, such as those arising under MSGP review. Fortunately, a great deal of information and methodological tools are available to assure that good engineering and design practice will address flood risk in a changing climate.

86. A comprehensive push to assemble lessons learned concerning flood risk management over decades of assessing and responding to storm damage culminated in the 1994 report, A Unified National Program for Floodplain Management (https://www.fema.gov/media-library-data/20130726-1733-25045-0814/unp_floodplain_mgmt_1994.pdf). One of several important contributions of this seminal report is the idea that hazards are complex and interconnected, and analysis of flood risk requires multi-hazard, multidisciplinary technical approaches to adequately address this reality. The words of the Forward to the 1994 report highlight key themes such as prioritizing hazard mitigation (as opposed to costly disaster response) and improving technical standards, noting that issues such as wind and coastal erosion are known to defy and even alter what may appear on a FEMA floodplain map:

> "In the 25 years since Congress first called for a unified national program to reduce flood losses, the Nation has made great progress in:

• recognizing the wide range of human and natural resources that are at risk in floodprone areas;

• accepting nonstructural mitigation measures as cost-effective components of floodplain management efforts;

• assessing the status of floodplain management in the United States and using those evaluations as a foundation for improvement of management approaches and measures; and

• achieving experience with and acceptance of mitigation as a principal means of reducing losses.

“However, the floods and severe storms of the last few years have been a sobering reminder of work yet to be done to further reduce the vulnerability of the residents of the United States to extreme natural events, and to more closely safeguard the valuable natural resources and functions that are found within the Nation's floodplains.

“The Nation is entering a new era in hazards and emergency management--one in which a comprehensive multi-hazard, multidisciplinary approach, a stronger emphasis on mitigation, and use of technological tools like geographic information systems, will play leading roles. This updated Unified National Program for Floodplain Management can be a benchmark for that new era. Management of flooding and, more recently, of floodplains, has been an important focus of programs within numerous Federal and state agencies for many decades. The considerable achievements of the floodplain management community in devising a conceptual framework, establishing intergovernmental coordination, cooperating with the private sector, improving technical standards, conducting evaluations of progress, and setting long-term national goals, are reflected in this document. Yet none of the methods or goals presented here is incompatible with a much-needed and broader multi-hazards mitigation approach. In fact, some technical and regulatory standards for flood risks are already being developed in conjunction with those for other hazards, notably wind and coastal erosion. This Unified National Program for Floodplain Management points the way for effective all-hazards management and mitigation on a national scale"

87. Another keystone document in modern applications of federal risk management decision-making in floodplain environments, is Executive Order 11988 which represents a major step forward in articulating the consensus of the need to approach flood hazards going beyond looking at lines on a map, and instead reflecting that such lines (namely those indicating a BFE) do not represent areas of "risk vs no risk" but rather an estimated delineation between a roughly calculated 1% annual flood risk and adjacent areas of remaining risk. Also, E.O. 11988 does a thorough job of defining the merits and frameworks for applying different degrees of risk management based on the type of facility in question. Thus, it is appropriate to interpret this document and its related implementation documents as a record of good engineering practices based on interpretation by multiple federal agencies and industry groups involved in the topic. With this in mind, page 41 of the Guidelines for Implementing E.O. 11988 and E.O. 13690 (https://www.fema.gov/media-library-data/1444319451483-f7096df2da6db2adfb37a1595a9a5d36/FINAL-Implementing-Guidelines-for-EO11988-13690_08Oct15_508.pdf) offers a succinct description of the importance of even small chances of flooding warranting greater scrutiny when it comes to critical facilities and related actions as it directs federal agencies

"to consider critical actions in more detail as a means to minimize risks posed to those actions that must occur in a floodplain. Critical actions include any activity for which even a slight chance of flooding is too great. The concept of critical action reflects a concern that the impacts of flooding 42 Guidelines for Implementing E.O. 11988 and E.O. 13690 on human safety, health, and welfare for many activities could not be minimized unless a higher degree of resilience was provided."

88. Consistent with the legal requirement to prevent pollutant discharges, MSGP must consider and address the well-known concept of resilience to flooding and severe and extreme weather impacts. The proposed language in Section 2.1.1.8 takes a step backwards in the direction of engineering design targeted at functional failure(rather than prevention of foreseeable pollutant discharges), such as by inundation, erosion, or other functional compromises which are likely to arise by adopting BFE as the reference elevation. In general this narrow-eyed approach to engineering (which is not focused on Clean Water Act compliance) typically fails to incorporate resilience-based considerations for how, and under what conditions, an engineering design can continue to perform some functions, even if other functions may have reached their "failure point", thus providing an added measure of risk management beyond the purported 1% annual flood event. An example of addressing resilience might be engineering a structure to that it becomes inundated (losing the function to prevent flooding) but remains resistant to erosion (hence able to perform reasonably well or with minor repair during the next storm). In addition to the flawed focus on "failure points", proposed Section 2.1.1.8 appears to reflect an absence of focus on the intention to avoid or minimize opportunities for engineering designs to result in catastrophic failure. An example of which could be a levee seeking to protect an industrial facility used for hazardous material storage and related manufacturing without considering resilience or whether retreat or substantial facility modification is warranted in the face of

known risks. The MSGP must specify steps for considering failure beyond basic performance levels and assessing and avoiding catastrophic failure modes.

89. Given the realities of climate change, good engineering practice at industrial facilities must include a robust analysis of pollutant spill and discharge pathways associated with severe weather, increased frequency and magnitude of flood events, storm surge and related hazards for coastal facilities, and sea level rise over the design life of installed and operated proposed infrastructure. Based on this analysis, the MSGP should require SWPPP components targeted at design, operation, and maintenance of facilities to prevent pollutant discharges through floodproofing measures including incremental or immediate retreat where necessary. The measures identified in the SWPPP must be implemented over the timeframe necessary to prevent discharges and protect public health safety and welfare.

90. To assure adequate design, operation, and maintenance of facilities, applicants must be required to assess and address system level or network effects. Without consideration and development of management practices to address resilience at the system level, facilities will continue to be at severe risk of flooding and pollutant discharges, including catastrophic discharges. For example, the approach proposed in Section 2.1.1.8 could result in the risky and flawed "dry socket approach" where a site may be designed to be kept dry by effective performance of a flood control levee, but have no dry road access for workers, first responders, or other emergency personnel to use for access to the site to perform preparation, operations, or response. Not only is this an example that falls far short of good engineering and design practice, but these flawed engineering approaches run a very high risk of failure, in particular catastrophic failure, especially as infrastructure ages and deferred maintenance risks increase. Another foreseeable example under the approach proposed in Section 2.1.1.8 would be that electrical power service

is lost, and concurrently backup power is also lost. Such events are not rare, and a backup generator used for floodwater pumping or other purposes may either experienced random mechanical failure, or commonly may experience stored fuel supplies washed away by wave action, contaminated with water by debris puncturing tanks or supply lines, or otherwise being affected by the very storm conditions the equipment was intended to handle.

91. The MSGP should specify addressing redundancy and/or alternative measures of enhancing reliability, efficiency, and/or self-sufficiency to improve functional reliability under multi-hazard scenarios related to extreme weather. Instead of adopting a fixed, and flawed, base flood elevation as proposed in Section 2.1.1.8, EPA should mandate that where there is a risk of pollutant discharges, consistent with good engineering practice the SWPPP must include specific identification of short-term and long-term measures to address both immediate concerns as described in paragraph 90 as well as longer term, permanent solutions to assure that at-risk facilities do not continue to present a substantial risk of pollutant discharges and to public health and safety. Near term measures should include:

    a. design of berms and other flood-proofing measures to an elevation necessary to account for site specific flood risks taking into consideration sea level rise, storm surge, extreme precipitation and other reasonably foreseeable risks;
    b. Mandatory maintenance of dry, safe access to the facility during reasonably foreseeable events; and
    c. Maintenance of backup generation and on-site or adjacent renewable energy (such as wind or solar PV) to perform the most critical functions required for emergency operations.

92. As both a near-term measure in severe instances and as a longer-term measure to assure that

pollutant discharges are reasonably managed, the MSGP must incorporate the consideration of retreat into the assessment for both new facilities, and especially the review of permits for existing facilities which are likely to lack such consideration at the time of original design or historic updates. Retreat may take the form of small but meaningful adjustments to the position of facilities on site, or where warranted retreat may take the form of moving facilities, or their key elements, to a new site. Retreat is often thought of in "map view" where the movement is horizontal, retreating laterally from the known hazard(s). However, retreat can at times be highly effective when it involves a change in vertical position to be above anticipated flood and/or wave levels, such as raising the site elevation through fill, building elevated on pilings, or by moving facility elements to higher ground levels on the same site. Another form of retreat involves establishing a master plan of temporal risk reduction, such as closing flood gates as extreme weather approaches, removing high-hazard materials from a facility during hurricane season, or even developing a decades-long plan of phased and/or sequenced measures over time to gradually remove high-risk activities from high-hazard sites. An example could be operating an existing refinery process outside of hurricane season for the multi-year period necessary to implement the construction of a new facility in a low-hazard location to handle the same process year-round at high efficiency. In any case, good engineering and design practice based on readily available data and methods demands that SWPPPs must reflect planning and action to address the foreseeable risks of severe weather, sea level rise, storm surges and extreme precipitation. Unfortunately, we are regularly seeing and experiencing the unfortunate results of past engineering decisions that have not considered these now well accepted realities – often with tragic and catastrophic results. Good engineering and design practice dictates a different result moving forward.

93. Managing severe flood risks can never be handled effectively at the site scale; it is best achieved at the appropriate system level, such as watershed-scale, harbor-scale, community-scale, etc. Otherwise pollutants may not only be released from an inadequately resilient site with brittle or failure-prone measures which have not accounted for the current known risks and scenarios, those pollutants and other storm damage related impacts may then enter or otherwise affect vulnerable areas which similarly lack suitable engineering features to protect them. The MSGP should specifically call out the need to take the issue of surrounding vulnerabilities into account. Lastly, to define good engineering practice in the MSGP program, I recommend use of the "Guidance for Incorporating Climate Change Impacts to Inland Hydrology in Civil Works Studies, Designs, and Projects" as adopted and periodically updated by the US Army Corps of Engineers (https://www.wbdg.org/ffc/dod/engineering-and-construction-bulletins-ecb/usace-ecb-2018-14). The MSGP should make use of the forward-looking information and step-wise analysis and design guidance contained in this and similar and/or future documents on the subject.

I swear, under penalty of perjury, that the foregoing is true and correct to the best of my knowledge.

Wendi Goldsmith

Wendi Goldsmith, PhD

Executed on 1 June 2020